

Instructions: Please enter your NAME, STUDENT ID NUMBER, FORM designation letter, and CRN on you op-scan sheet. The CRN should be written in the upper right-hand box labeled “Course”. In the box labeled “Form”, write the letter **A**. Darken the appropriate circles below your Student ID Number and form designation. **Use a # 2 pencil only. No electronic devices (calculators, cell phones, PDA’s, pagers, etc.) may be used in the completion of this exam.**

Mark your answers in rows 1 – 20 of the op-scan sheet. You have one hour to complete this portion of the final exam. Your score for this part of the final will be the number of correct answers. Turn in your op-scan sheet with your answers **and this “signed” question sheet** at the end of this part of the final exam.

Honor Pledge: In the Constitution of the Virginia Tech Undergraduate Honor System, cheating is defined as follows: “Cheating includes the actual giving or receiving of unfair advantage on any form of academic work, or attempts there of.”

For the purpose of this portion of the final exam, “no” aid or assistance is authorized. You may have with you only this form, your op-scan sheet, and your pencil.

Read and sign the following Honor Pledge:

“ I have neither given nor received unauthorized assistance on this assignment.”

signature

date

name (printed)

Do not begin the exam until you are told to do so.

1. Given the following data set

m	8	8	16	27	28
n	5	6	8	10	11

Which one of the following is a true statement?

- (1) n is a function of m but m is not a function n.
- (1) m is a function of n but n is not a function of m.
- (1) m is a function n and n is a function of m.
- (1) m is not a function of n and n is not a function of m.

2. $N(x)$ is the number of weekly viewers in millions of a certain television series for week x where $1 \leq x \leq 26$. Find the rate of increase of the weekly audience for week 2. ($x = 2$)

$$N(x) = (60 + 2x)^{1/2}$$

- (1) 8 million viewers per week
- (1) 1/16 million viewers per week
- (1) 1/8 million viewers per week
- (1) 16 weeks per 1million viewers

3. Which one of the following data sets is linear?

(1)

x	-2	-1	0	1	2
$f(x)$	19	9	3	1	3

(2)

x	-2	-1	0	1	2
$f(x)$	2	4	8	16	32

(3)

x	-2	-1	0	1	2
$f(x)$	9	7	3	1	-1

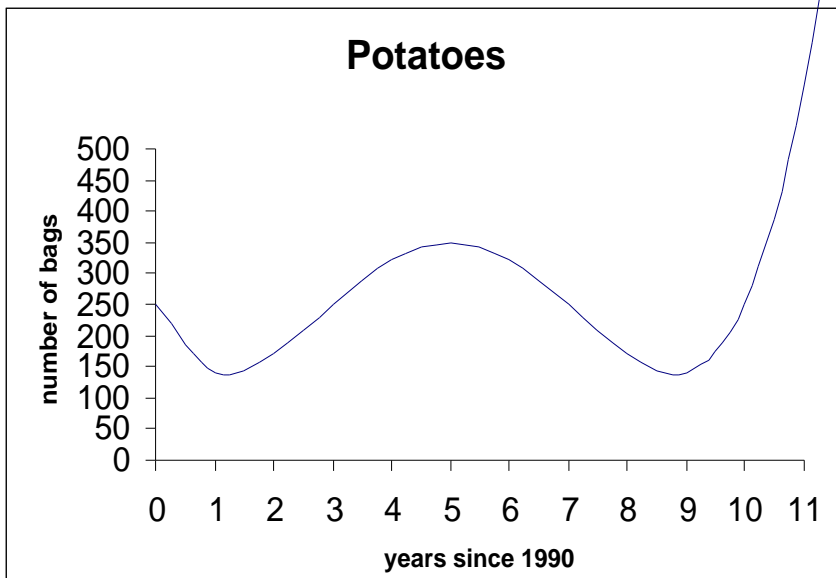
(4)

x	-2	-1	0	1	2
$f(x)$	-6	-8	-10	-12	-14

4. $\lim_{x \rightarrow 0} \frac{3 + 5x^2}{x^3 - 2x^2} =$

- (1) -5/2
- (1) 0
- (1) 1
- (1) diverges to

5. Below is a graph representing the number of bags (in thousands) of Golden Eye potatoes sold in a certain area of Virginia in any given year since 1990 till 2001.



Using the graph above choose the correct statement below.

- (1) The absolute maximum number of bags was sold in 1995 and an absolute minimum in 1999.
 - (2) The absolute maximum number of bags was sold in 1990.
 - (3) The absolute minimum number of bags was sold in 1991 only.
 - (4) The absolute minimum number of bags was sold in 1999 and the absolute maximum was sold in 2001.
6. The table below gives you information about the number q of bottles of a new dog shampoo being sold and the marginal profit information about this product. Use the table to estimate the value of q as closely as possible for which maximum profit will occur.

q	0	10	25	35	40	48	55
mp	5	4.2	2.5	1.8	-0.9	-1.3	-2

- (1) $q = 55$
 - (2) $q = 10$
 - (3) $q = 40$
 - (4) $q = 35$
7. $\lim_{x \rightarrow 3^-} \frac{-4}{3+x} =$
- (1) diverges to
 - (2) $-4/3$
 - (3) diverges to $-\infty$
 - (4) -4
8. You can sell 300 of your limited edition art prints if you sell the prints for \$50 each but you can sell

only 200 prints if the selling price is \$60 per print. Find the linear demand equation in the form $q = f(p)$ to represent this data.

(1) $q = -\frac{1}{10}p + 80$

(2) $q = -\frac{1}{10}p + 305$

(3) $q = -10p + 800$

(4) $q = -10p + 3050$

9. If the average cost to a small company is given to be $AC = 100q^2 - 6000q + 540$ dollars per item, then determine where minimum average cost will occur when q is number of items made.

(1) $q = 0$

(2) $q = 30$

(3) $q = 3$

(4) $q = 60$

10. The function $y = e^x$ at $x = 0$, has the slope $\lim_{h \rightarrow 0} \frac{e^h - 1}{h}$. Use the table below to determine

this value.

h	-0.1	-0.01	-0.001	0.001	0.01	0.1
$\frac{e^h - 1}{h}$	0.9516	0.9950	0.9995	1.0005	1.0050	1.0517

(1) 1

(1) diverges to

(1) 1.0517

(1) 0.99995

11. If the demand for decorative candles is $p(q) = 102 - 3q$ where p is price and q is number of candles sold. Which equation below represents marginal revenue?

(1) $mr = 102q - 3q^2$

(1) $mr = 102 - 6q$

(3) $mr = 102 - 3q$

(4) $mr = -3$

12. The Homestar Company sells hummingbird feeders for \$6 per unit. Fixed costs are \$37,500 and variable costs are \$2 per feeder. Find the profit function in terms of q number of feeders.

- (1) $P(q) = 37500 - 4q$
- (2) $P(q) = 8q - 37500$
- (3) $P(q) = 4q - 37500$
- (4) $P(q) = 4q + 37500$

13. Find the slope of the tangent line to $f(x) = \frac{1-x^2}{2x+1}$ at $x = 2$.

- (1) $-26/25$
- (2) -1
- (3) $-14/25$
- (4) 2

14. In 1991 the number of households in outer Kokostan with computers was 25 million while in 1993, 30 million of the households had computers. What is the percent change in the of the households with computers from 1991 to 1993?

- (1) 10%
- (1) 2.5%
- (1) 17%
- (1) 20%

15. If the cost for Mittens for Kittens Pet Shop is given to be $C(30) = 100$ and marginal cost is given to be $C'(30) = 8$ when 30 kittens are sold, find the correct interpretation for this information.

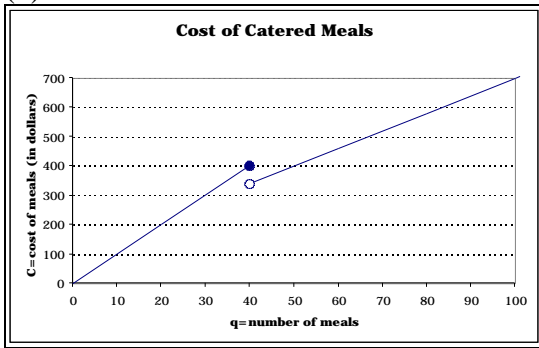
- (1) The total marginal cost to maintain 30 cats is \$8.
- (2) The increased in marginal cost when the number is increase to 31 is \$8.
- (3) Total cost is decreased by \$8 when 31 cats are maintained.
- (4) The total cost estimated for 31 cats is \$108.

16. At midnight you looked out your window and saw 6 Leprechauns burying gold in your back yard. At 2:00 AM you looked again and counted 24 of the little people. Find an exponential model of the form $y = a(b)^t$ to represent this data. Use your model to predict the number of Leprechauns that will be in your back yard at 3:00 AM.

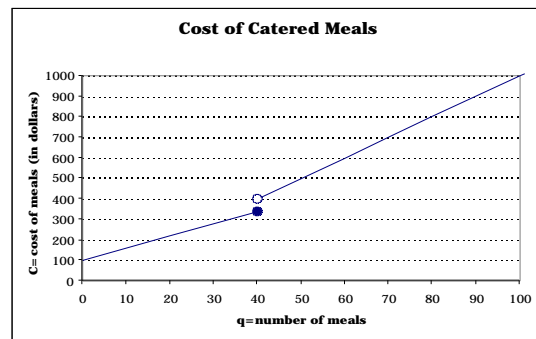
- (1) 48 leprechauns
- (2) 42 leprechauns
- (2) 39 leprechauns
- (2) 33 leprechauns

17. The cost of having holiday meals catered is $C(q) = \begin{cases} 6q + 100 & \text{if } 0 < q < 40 \\ 10q & \text{if } 40 < q < 200 \end{cases}$ dollars where q represents the number of meals. Which of the following is a graph of $C(q)$?

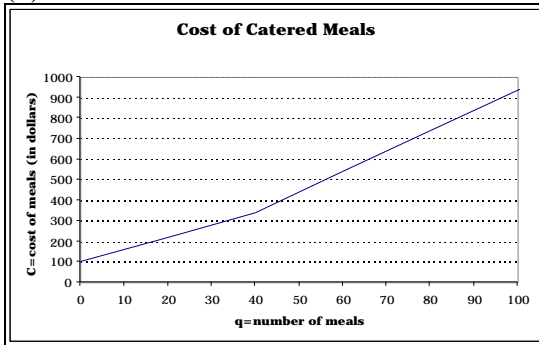
(1)



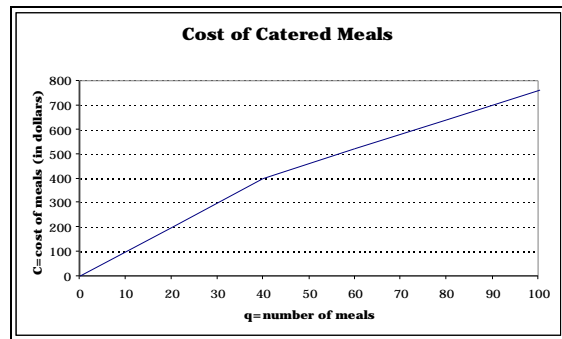
(2)



(3)



(4)



18. The mathematics editor at a major publishing house estimates that if no complimentary copies of a new textbook are distributed to professors, the first-year sales of the textbook will be 5,000 copies. In general, when x complimentary copies are distributed to professors, it is expected that $f(x)$ copies of the textbook will be sold during the first year, but first-year sales are not expected to exceed 20,000 copies, regardless of the number of complimentary copies distributed. Given that $f(x)$ is modeled by Newton's Law of Cooling, which of the following might be the equation for $f(x)$?

(1) $f(x) = 20000 - 15000e^{-0.2x}$

(2) $f(x) = \frac{20000}{1 + 3e^{-0.2x}}$

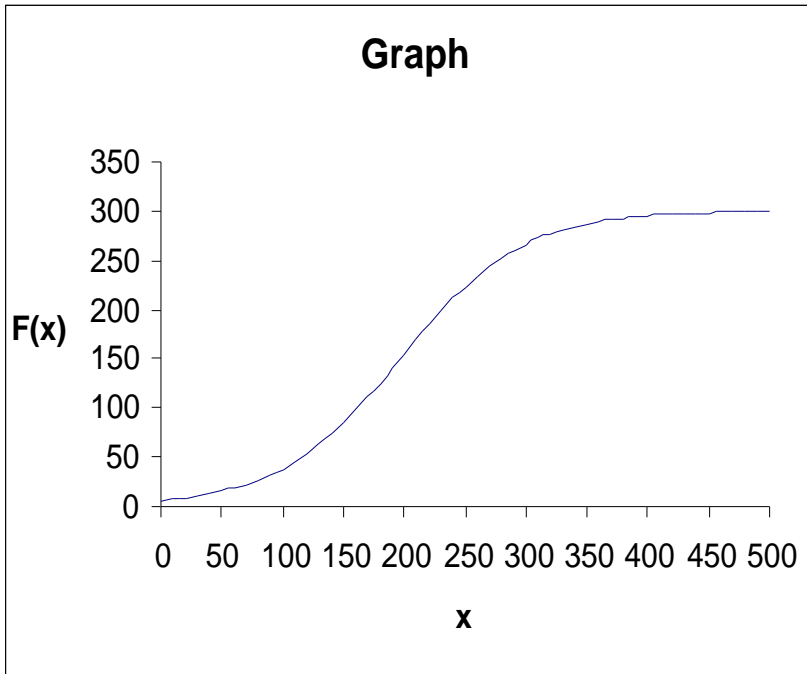
(3) $f(x) = 5000e^{0.2x}$

(4) $f(x) = 5000(1.2)^x$

19. A company is marketing a new design of Frisbees. Data has been collected and analyzed giving the following results: $\frac{dS}{dq} = -2$ for $q = 10000$, $S'(9998) = .56$, and $S''(9999) = -.066$. If $S(q)$ represents the sales volume in thousands of dollars and q is the number of new design Frisbees sold, choose the correct interpretation of the analysis given above.

- (1) If they sell 10000 Frisbees, then they will only need to make \$2.00 more to break even.
- (2) If they sell 9998 Frisbees, then sales are decreasing.
- (3) The graph of sales is concave up for the value $q = 9999$ Frisbees.
- (4) Sales are estimated to reach their maximum at $q = 9999$ Frisbees.

20. Given the graph below, which set of information correctly describes this graph?



- 1. $f'(x) > 0$ and $f''(x) > 0$ over the interval $[0, 500]$
- 2. $f'(x) > 0$ and $f''(x) < 0$ over the interval $[0, 500]$
- 3. $f''(x) > 0$ over the interval $[0, 210]$ and $f''(x) < 0$ over the interval $[210, 500]$
- 4. $\lim_x f(x)$ does not exist.